The Center for Astrophysical Thermonuclear Flashes

FLASH

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The FLASH code
1. Parallel, adaptive-mesh refinement (AMR) code
2. Block structured AMR; a block is the unit of computation
3. Designed for compressible reactive flows
4. Can solve a broad range of (astro)physical problems
5. Portable: runs on many massively-parallel systems
6. Scales and performs well
7. Fully modular and extensible: components can be combined to create many different applications
Flash Center

- **CS/Applications Group (code group)**
  - Develops code
  - Implements algorithm
  - Integrates and maintains contributions
  - Testing and Debugging
  - Supports internal and external FLASH users

- **Astrophysics Group**
  - Runs large simulations
  - Scientific Discovery using the FLASH code

- **Visualization Group**
  - Serves some in-house visualization needs
  - Preparation of presentations and movies
  - Cannot support all day-to-day viz needs
Some Simulations of Interest

- **Supernova Ia**
  - Full-star 3D simulations of deflagration & detonation
- **3D Turbulent Nuclear Burning**
- **External users: Galaxy cluster collisions, etc.**

- **In Future: High-Energy-Density Physics**
  - E.g., simulation of shock experiments at Omega or NIF
Visualization needs

- For debugging!
  - Small test problems
  - Scientists or code developers
  - Use “xflash3” (IDL based), VisIt

- For “regular simulations”
  - Day-to-day use of visualization for scientists “to see what is going on” in a simulation
  - Mostly use VisIt

- For preparing publications
  - Or movies etc.
  - Use VisIt, or specially developed tools
FLASH Output

- Plot files
  - Input for visualization

- Checkpoint files
  - Also can be input for visualization

- Particle files
  - Need visualization
  - Need post-processing code (developed in house)

- Other simulation-specific files (lower volume)

- We have defined FLASH data formats for
  - HDF5 (supported by VisIt)
  - Pnetcdf
Future

Greatest Problems right now:

- Reliably and quickly deal with very large files
  Should not slow down too much for > 250 GB files

For Future:

- More data, Larger files
- Convenient and fast zooming in, slices
- In situ?
- (unforeseen things)